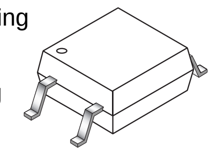
FULL PITCH MINI-FLAT PACKAGE 4-PIN OPTOCOUPLERS

HMA121 Series HMA124 HMA2701 Series HMAA2705

DESCRIPTION

The HMA124, HMA121 series and HMA2701 series consists of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a compact 4-pin mini-flat package. The lead pitch is 2.54 mm.

The HMAA2705 consists of two gallium arsenide infrared emitting diodes, connected in inverse parallel, driving a single silicon phototransistor in a compact 4-pin mini-flat package. The lead pitch is 2.54mm.



FEATURES

- Compact 4-pin package
  (2.4 mm maximum standoff height)
- Current Transfer Ratio in selected groups

HMA121: 50–600%	HMA2701: 50–300%
HMA121A: 100–300%	HMA2701A: 150–300%
HMA121B: 50–150%	HMA2701B: 80–160%
HMA121C: 100–200%	HMA124: 100% MIN
HMA121D: 50–100%	HMAA2705: 50–300%
HMA121E: 150–300%	
HMA121F: 100–600%	

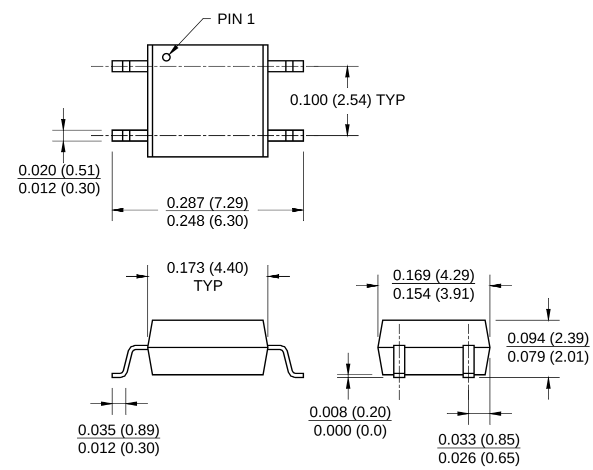
- Available in tape and reel quantities of 500 and 2500.
- Applicable to Infrared Ray reflow (230°C max, 30 seconds.)
- BSI (File #8611/8612), CSA (File #1162301), UL (File #E90700) and VDE (File #136480) certified
- Creepage ≥ 5 mm, typical 5.2 mm
- Clearance ≥ 5 mm, typical 5.2 mm

APPLICATIONS

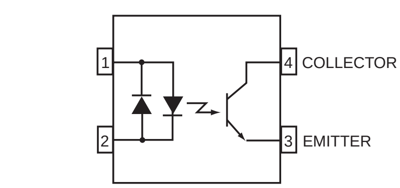
HMAA2705
- AC line monitor
- Unknown polarity DC sensor
- Telephone line receiver

HMA121 series, HMA2701 series, HMA124
- Digital logic inputs
- Microprocessor inputs
- Power supply monitor
- Twisted pair line receiver
- Telephone line receiver

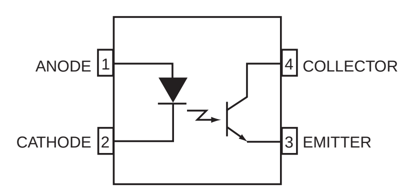
PACKAGE DIMENSIONS



NOTE
All dimensions are in inches (millimeters)



Equivalent Circuit
(HMAA2705)



Equivalent Circuit
(HMA2701, HMA121, HMA124)

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise specified)

Parameter		Symbol	Value	Units
TOTAL PACKAGE				
Storage Temperature		T_{STG}	-40 to +125	°C
Operating Temperature		T_{OPR}	-40 to +100	°C
EMITTER				
Continuous Forward Current		$I_{F\ (avg)}$	50	mA
Peak Forward Current (1 µs pulse, 300 pps.)		$I_{F\ (pk)}$	1	A
Reverse Input Voltage (HMA)		V_R	6	V
Power Dissipation		P_D	70	mW
Derate linearly (above 25°C)			0.65	mW/°C
DETECTOR				
Continuous Collector Current			80	mA
Power Dissipation		P_D	150	mW
Derate linearly (above 25°C)			2.0	mW/°C
Collector-Emitter Voltage	HMA2701 Series, HMAA2705	V_{CEO}	40	V
	HMA121 Series, HMA124		80	
Emitter-Collector Voltage		V_{ECO}	7	V

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

INDIVIDUAL COMPONENT CHARACTERISTICS

Parameter	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
EMITTER Forward Voltage	(I_F = 10 mA)	V_F	HMA121 Series	1.0		1.3	V
			HMA124				
	(I_F = 5 mA)		HMA2701 Series			1.4	
	(I_F = ± 5 mA)		HMAA2705				
Reverse Current	(V_R = 5 V)	I_R	HMA2701 Series			5	µA
			HMA121 Series				
			HMA124				
DETECTOR Breakdown Voltage Collector to Emitter	(I_C = 1 mA, I_F = 0)	BV_{CEO}	HMA121 Series	80			V
			HMA124				
			HMA2701 Series	40			
			HMAA2705				
Emitter to Collector	(I_E = 100 µA, I_F = 0)	BV_{ECO}	All	7			
Collector Dark Current	(V_{CE} = 40 V, I_F = 0)	I_{CEO}	All			100	nA
Capacitance	(V_{CE} = 0 V, f = 1 MHz)	C_{CE}	All		10		pF

TRANSFER CHARACTERISTICS (T_A = 25°C)

Characteristic	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
DC Current Transfer Ratio	(I_F = ± 5 mA, V_{CE} = 5 V)	CTR	HMAA2705	50		300	%
	(I_F = 5 mA, V_{CE} = 5 V)		HMA2701	50		300	
			HMA2701A	150		300	
			HMA2701B	80		160	
	(I_F = 5 mA, V_{CE} = 5 V)		HMA121	50		600	
			HMA121A	100		300	
			HMA121B	50		150	
			HMA121C	100		200	
			HMA121D	50		100	
			HMA121E	150		300	
			HMA121F	100		600	
	(I_F = 1 mA, V_{CE} = 0.4 V)		HMA121F	30			
	(I_F = 1 mA, V_{CE} = 0.5 V)		HMA124	100		1200	
	(I_F = 0.5 mA, V_{CE} = 1.5 V)		HMA124	50		—	
CTR Symmetry	(I_F = ± 5 mA, V_{CE} = 5 V)	—	HMAA2705	0.3		3.0	
Saturation Voltage	(I_F = ± 10 mA, I_C = 2 mA)	$V_{CE\ (SAT)}$	HMAA2705			0.3	V
	(I_F = 10 mA, I_C = 2 mA)		HMA2701			0.3	
			HMA2701A			0.3	
			HMA2701B			0.3	
	(I_F = 8 mA, I_C = 2.4 mA)		HMA121			0.4	
			HMA121A			0.4	
			HMA121B			0.4	
			HMA121C			0.4	
			HMA121D			0.4	
			HMA121E			0.4	
			HMA121F			0.4	
	(I_F = 1 mA, I_C = 0.2 mA)		HMA121F			0.4	
	(I_F = 1 mA, I_C = 0.5 mA)		HMA124			0.4	
Rise Time (Non-Saturated)	(I_C = 2 mA, V_{CE} = 5 V) (R_L = 100Ω)	t_r			3		µs
Fall Time (Non-Saturated)	(I_C = 2 mA, V_{CE} = 5 V) (R_L = 100Ω)	t_f			3		

ISOLATION CHARACTERISTICS

Characteristic	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
Steady State Isolation Voltage	(1 Minute)	V_{ISO}	All	3750			VRMS

** All typicals at TA = 25°C

TYPICAL PERFORMANCE CURVES

Fig. 1 Forward Current vs. Forward Voltage

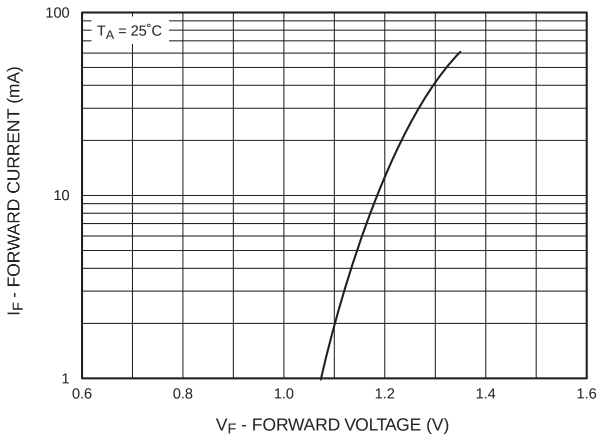


Fig. 2 Collector Current vs. Forward Current

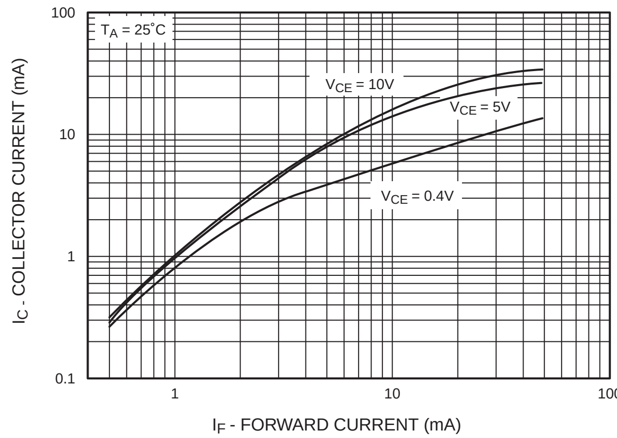


Fig. 3 Current Transfer Ratio vs. Forward Current

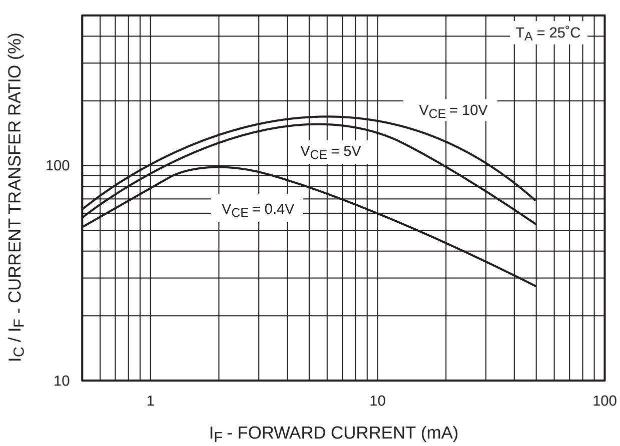


Fig. 4 Collector Current vs. Temperature

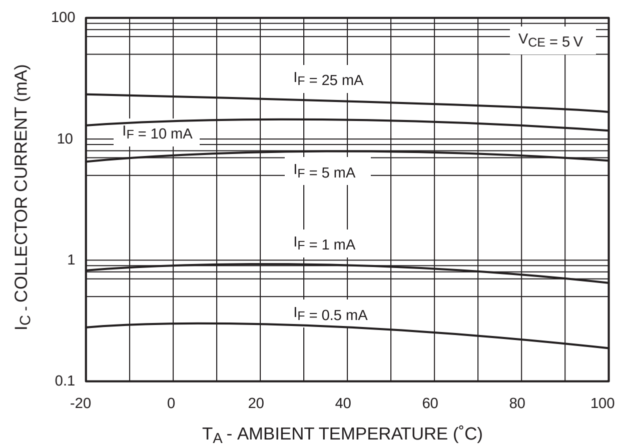


Fig. 5 Collector Current vs. Collector-Emitter Voltage

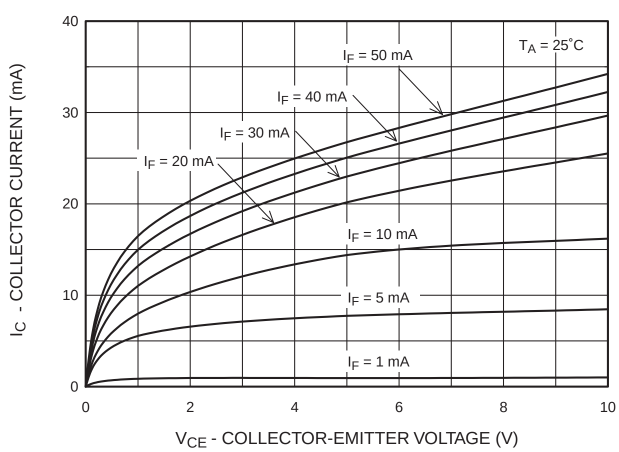


Fig. 6 Collector Current vs. Collector-Emitter Voltage

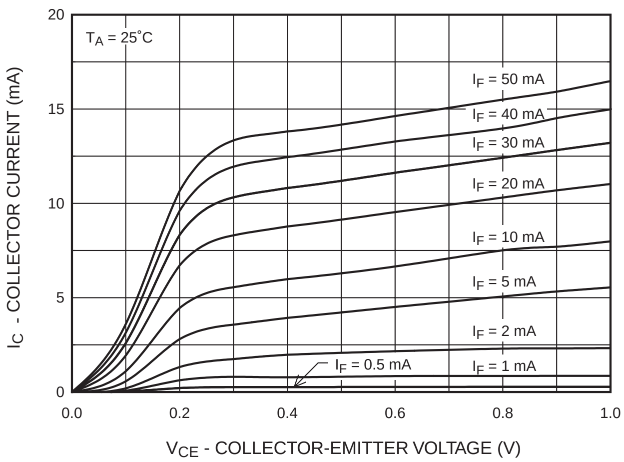


Fig. 7 Collector Dark Current vs. Temperature

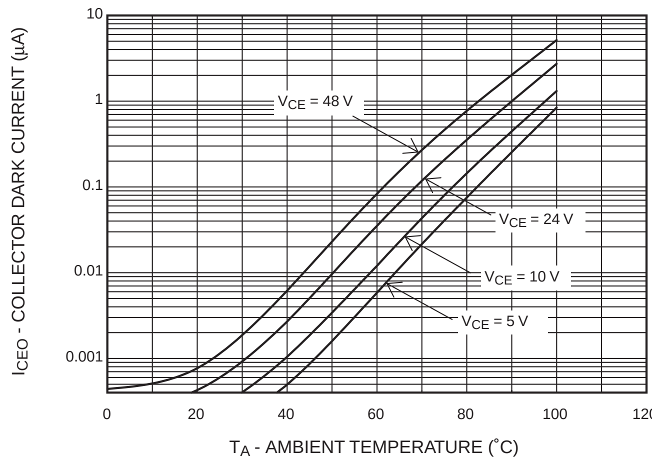


Fig. 8 Switching Time vs. Load Resistance

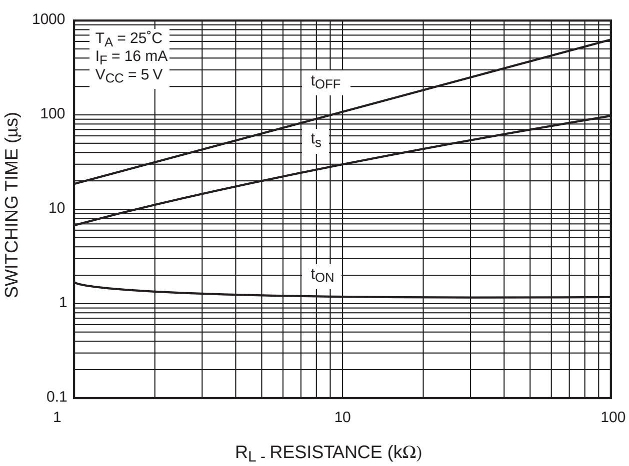
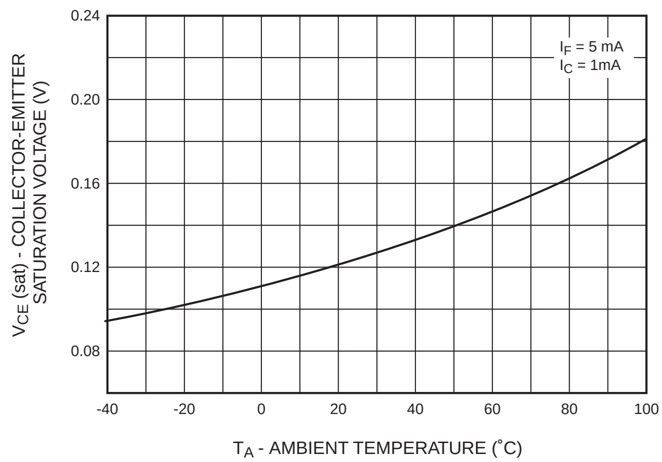


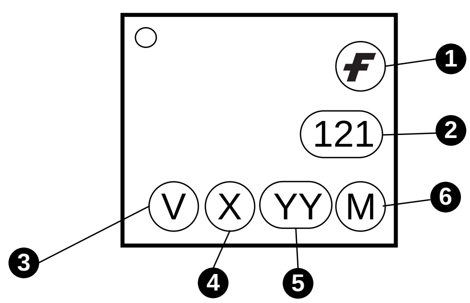
Fig. 9 Collector-Emitter Saturation Voltage vs. Temperature



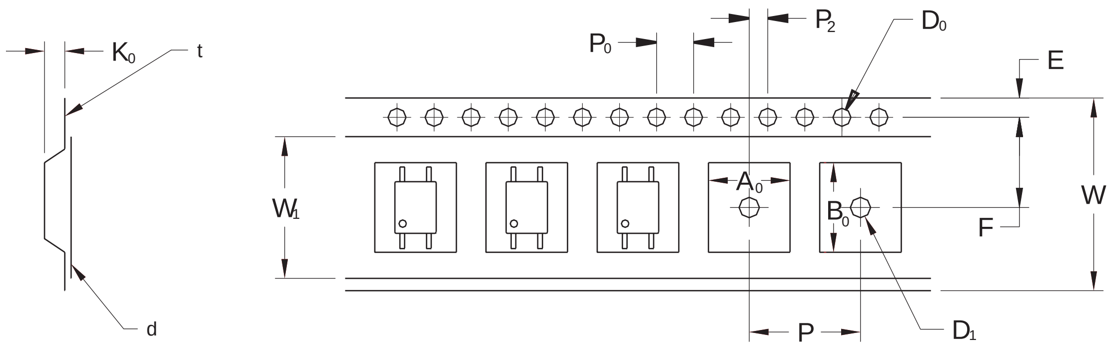
ORDERING INFORMATION

Option	Description
V	VDE Approved
R1	Tape and Reel (500 units)
R2	Tape and Reel (2500 units)
R3	Tape and Reel (500 units; unit 180° rotated)
R4	Tape and Reel (2500 units; unit 180° rotated)
R1V	Tape and Reel (500 units) and VDE Approved
R2V	Tape and Reel (2500 units) and VDE Approved
R3V	Tape and Reel (500 units; unit 180° rotated) and VDE Approved
R4V	Tape and Reel (2500 units; unit 180° rotated) and VDE Approved

MARKING INFORMATION

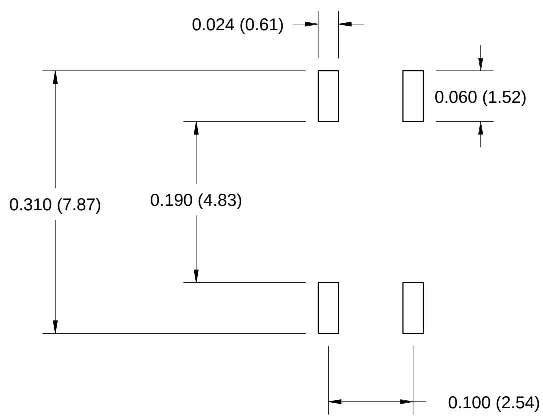


Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	One digit year code
5	Two digit work week ranging from ‘01’ to ‘53’
6	Assembly package code

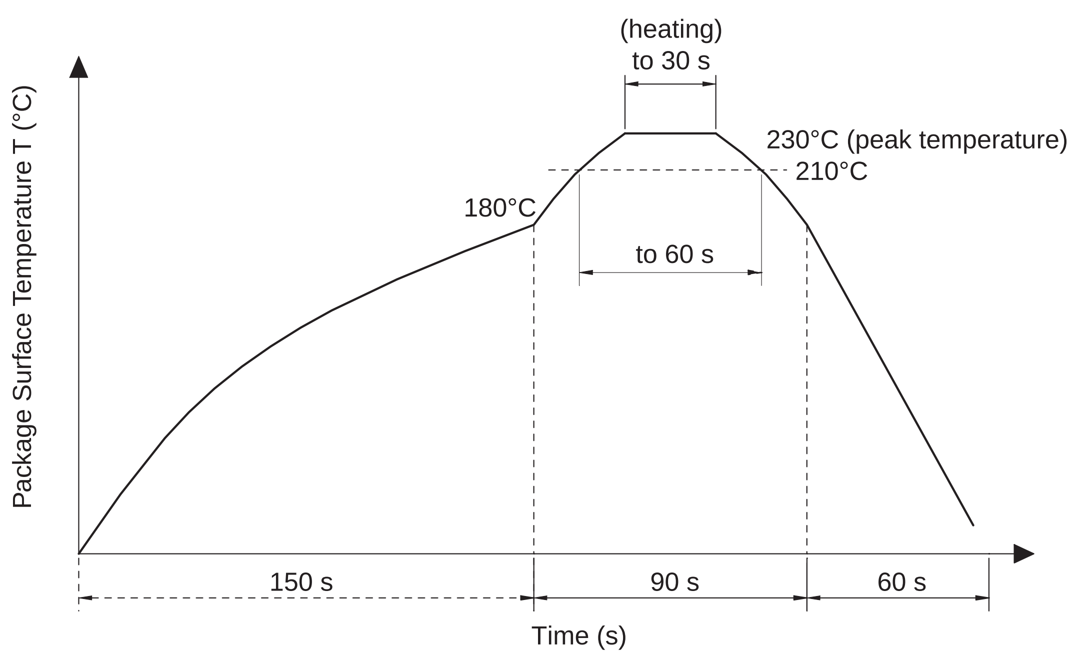


Description		Symbol	2.54 Pitch Dimensions (mm)
Tape Width		W	12.00±0.4
Tape Thickness		t	0.30±0.20
Sprocket Hole Pitch		P_0	4.00±0.20
Sprocket Hole Dia.		D_0	1.55±0.20
Sprocket Hole Location		E	1.75±0.20
Pocket Location		F	5.50±0.20
		P_2	2.00±0.20
Pocket Pitch		P	8.00±0.20
Pocket Dimension		A_0	4.40±0.20
		B_0	7.30±0.20
		K_0	2.30±0.20
Pocket Hole Dia.		D_1	1.55±0.20
Cover Tape Width		W_1	9.20
Cover Tape Thickness		d	0.065±0.02
Max. Component Rotation or Tilt			20° max
Devices Per Reel	R1		500
	R2		2500
Reel Diameter	R1		178 mm (7")
	R2		330 mm (13")

Footprint Drawing for PCB Layout



Recommended Infrared Reflow Soldering Profile



- Peak reflow temperature: 230°C (package surface temperature) for 30 seconds
- Time of temperature higher than 210°C: 60 seconds or less
- One time soldering reflow is recommended

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